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Before the
FEDERAL COMMUNICATIONS COMMISSION
Washington, D.C. 20554

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FEDERAL COMMUNICATIONS COMMISSION
OFFICE OF SECRETARY

In the Matter of	)	
	)	
Implementation of Section 19 of	)	
the Cable Television Consumer	)	
Protection and Competition Act of 1992	)	CS Docket No. 94-48
	)	
Annual Assessment of the Status of	)	
Competition in the Market for the	)	
Delivery of Video Programming	)	

REPLY COMMENTS OF TELEDESIC CORPORATION

TELEDESIC CORPORATION

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July 29, 1994

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SUMMARY

As the Commission analyzes competition to cable television in the video distribution marketplace, it must adopt a long-term perspective. Such an outlook shows that the local multipoint distribution service ("LMDS") is a redundant broadcast service that offers the same video entertainment services in areas that are or will be served by conventional cable systems, direct broadcast satellites, video dialtone, the multichannel multipoint distribution service, and video programming provided by telephone companies. LMDS is essentially a proposed service that utilizes inefficient analog AM or FM technology and is limited by technical constraints to areas of high population density.

The marginal long-term benefits of LMDS are outweighed by the preclusive effect that the authorization of LMDS in the 28 GHz band will have on the development in the United States of international satellite systems. Unlike LMDS, satellite services offer long-term and unique benefits to the communications marketplace because satellite technology provides a full range of information services to developing and undeveloped parts of the United States and the world. These areas otherwise would not receive affordable access to communications services due to the economic constraints of fiber optics, cable and other terrestrial services. If the United States unilaterally authorized the incompatible LMDS use of the 28 GHz band, then the development of innovative global satellite systems would be curtailed and the United States would lose its leadership position in the satellite industry.

Before the
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Washington, D.C. 20554

In the Matter of	)	
	)	
Implementation of Section 19 of the Cable Television Consumer Protection and Competition Act of 1992	)	CS Docket No. 94-48
	)	
Annual Assessment of the Status of Competition in the Market for the Delivery of Video Programming	)	

To: The Commission

REPLY COMMENTS OF TELEDESIC CORPORATION

Teledesic Corporation ("Teledesic"), by its attorney, and pursuant to Section 1.415 of the rules and regulations of the Federal Communications Commission ("FCC" or "Commission"), 47 C.F.R. § 1.415 (1993), hereby submits its Reply Comments in the above-referenced proceeding. Teledesic filed an application with the Commission on March 21, 1994, proposing to construct, launch and operate a domestic and international non-geostationary satellite system in the fixed satellite service ("FSS") in the 27.5 - 29.5 GHz band (the "28 GHz band"). Application of Teledesic Corporation, File No. 22-DSS-P/LA-94 (March 21, 1994), as amended. The Teledesic satellite system will provide "bandwidth on demand" that can accommodate two-way, switched services from basic voice channels to high-rate data transmission and interactive multimedia applications.

By its Notice of Inquiry, the Commission is seeking to gather information sufficient to analyze the competition to cable provided by alternative video distribution technologies. Implementation of Section 19 of the Cable Television Consumer Protection and Competition Act of 1992 Annual Assessment of the

Status of Competition in the Market for the Delivery of Video Programming, CS Docket No. 94-48, FCC 94-119, at ¶ 8 (released May 19, 1994) ("Notice of Inquiry"). One potential competitor to cable on which comment is sought is the local multipoint distribution service ("LMDS"). Id. at ¶ 28. In response to this request, CellularVision of New York, Inc. ("CVNY") filed comments claiming that LMDS is a viable competitor to cable and should be authorized by the Commission in the 28 GHz band. Comments of CellularVision of New York, L.P., CS Docket No. 94-48 (June 29, 1994) ("CVNY Comments"). Teledesic has a vital interest in this proceeding because it and other United States proponents of international satellite systems will be inhibited or precluded entirely from entry into the global information marketplace if LMDS is authorized in the 28 GHz band.

Contrary to the position advocated by CVNY, the video distribution market currently is competitive and will only become more so as a variety of technological and regulatory currents merge. Consequently, Teledesic urges the Commission to take a long-term outlook in its evaluation of cable competition. Presently, LMDS is a redundant broadcast service which offers the same video entertainment services in urban areas that presently are served by conventional cable television systems and other video programming outlets. As will be demonstrated below, the marginal long-term benefits of LMDS are outweighed by the preclusive effect that the authorization of LMDS in the 28 GHz band will have on the development in the United States of international satellite systems.

I. BACKGROUND

In January 1993, the FCC proposed to allocate the 28 GHz band to LMDS, a form of wireless cable. Notice of Inquiry, at ¶ 26. The Commission's proposal was based, in large part, on the fact that at that time the 28 GHz band virtually was unused. Rulemaking to Amend Part 1 and Part 21 of the Commission's Rules to Redesignate the 27.5 - 29.5 GHz Frequency Band and to Establish Rules and Policies for Local Multipoint Distribution Service, 8 FCC Rcd 557, 558 (1993). LMDS advocates requested 2 GHz of spectrum in the 28 GHz band, which they claimed was needed to accommodate two 50-channel LMDS systems in each market. See Rulemaking to Amend Part 1 and Part 21 of the Commission's Rules to Redesignate the 27.5 - 29.5 GHz Frequency Band and to Establish Rules and Policies for Local Multipoint Distribution Service, 9 FCC Rcd 1394, 1394 (1994) ("Rulemaking").

The landscape has changed significantly since the FCC initiated the rulemaking proceeding in early 1993 to consider redesignation of the 28 GHz band to LMDS. Subsequently, there have been many proposals announced for the development and use of global satellite systems in the 28 GHz band. Earlier this year, Teledesic filed an application with the FCC for authority to operate a domestic and international satellite system in the 28 GHz band. In addition to Teledesic, Hughes Communications Galaxy, Inc. proposes to operate a FSS satellite system in the band, and Motorola Satellite Communications, Inc. proposes to use a portion of the 28 GHz band for the feeder links of its mobile

satellite service ("MSS") system.1/ Other authorized users of the 28 GHz band in the United States are Norris Satellite Communications, Inc., which proposes to operate a commercial geostationary satellite system, and the National Aeronautics and Space Administration, which operates the Advanced Communications Technology Satellite ("ACTS") system. These operators plan to invest several billions of dollars in their satellite systems. Indeed, the U.S. commercial satellite industry generated more than $5 billion in revenue in 1993. In addition to the many new international satellite systems proposed by United States companies for the 28 GHz band, the Japanese and Europeans already are operating in the 28 GHz band and there are numerous other proposals on the drawing board for future 28 GHz band satellite systems.

Given conflicting views on whether LMDS and satellite services can coexist in the 28 GHz band, the Commission recently initiated a negotiated rulemaking proceeding to address technical sharing issues between these two services. Request for Comments, 59 Fed. Reg. 7961 (Feb. 17, 1994). While the best outcome of that proceeding would be an agreement on a means by which LMDS and satellite services could coexist in the same frequencies, interference studies performed to date do not provide much encouragement in that regard.

1/ TRW, Inc. has applied to use a portion of the 29.5 - 30.0 GHz band for the feeder links of its MSS system and the FCC is considering the possible use of the 28 GHz band by all of the MSS low earth orbit satellite applicants.

II. LMDS PROVIDES NO SIGNIFICANT BENEFIT AS A SOURCE OF COMPETITION IN THE VIDEO DISTRIBUTION MARKETPLACE.

LMDS will provide no significant benefit as a source of competition in the video distribution market because it will deliver duplicative broadcast video entertainment services to the same markets that already have or will have a number of video service options. Any additional competition to cable provided by LMDS would be of marginal utility because cable competition already exists or will exist in the high-density areas in which LMDS will be deployed. Moreover, as discussed more fully in Section III of these Reply Comments, while LMDS may be a short-term source of cable competition, this tenuous benefit is substantially outweighed by the long-term benefits of international satellite systems proposed by United States companies or United States-led consortia, which would be precluded if LMDS were licensed in the 28 GHz band.

LMDS is still essentially a proposed service. There is only one permanent operational LMDS system with only a few hundred subscribers in Brooklyn, New York. CVNY Comments, at 6. This cellular television system provides video entertainment services indistinguishable from cable systems and is hardly "revolutionary." Id. at 3. While LMDS advocates claim the ability to create two-way switched architectures providing interactive services, no proponent has implemented such a system. CVNY Comments at 3 n.3. The FCC has no evidence that LMDS is capable of providing viable competition to franchised cable television systems, nor whether it can provide service over a large geographic territory. Rulemaking, 9 FCC Rcd at 1397.

Thus, the FCC recently acknowledged that the claims of the LMDS proponents about the viability of terrestrial LMDS service remain unproven. Id.

Because of the propagation characteristics of signals in the 28 GHz band, it is unlikely that LMDS will be used to reach markets lacking cable TV services or competitive alternatives. Proposed LMDS systems employ analog AM or FM technology, which makes inefficient use of 28 GHz band spectrum and which already is outdated by digital technology. Notice of Inquiry, at ¶ 52. Although CVNY claims that LMDS can be "rapidly deployed throughout the country," id. at 4, technical constraints of the architecture of LMDS make it unlikely that the system will be used to reach remote markets lacking competitive alternatives to cable. Signals in the 28 GHz band are subject to rain attenuation and blocking by terrain, buildings and foliage. While LMDS advocates claim that cell sites with a radius of three to six miles theoretically are possible, the practical limitations of line-of-site transmission through natural and urban terrain place much stricter constraints on the size of the service area in most environments.

In an attempt to mitigate some of these constraints, some theoretical LMDS designs have attempted to employ "multipath" techniques to reflect signals off buildings and other obstructions in more congested urban areas. There is dispute even among LMDS parties regarding the feasibility of these techniques. Nonetheless, these inefficient technologies are the basis for the claim by some LMDS advocates that 1 GHz of spectrum is required to deliver 50 channels of video entertainment.

Finally, line-of-sight restrictions associated with a horizontal signal will require multiple unsightly repeaters and reflectors, which not only create local zoning problems but also increase the start-up and maintenance costs of LMDS. See CVNY Comments, at 4.

With a rigidly constrained service area, the economics of LMDS strongly favor its use in areas of high population density.2/ However, these areas already have a number of existing video programming options and soon will have many additional options, including cable TV, Direct Broadcast Satellite ("DBS") service, and video service such as video dialtone from telephone companies and other competitive service providers. Notice of Inquiry, at ¶¶ 30, 42. In addition, LMDS will compete with the multichannel multipoint distribution service ("MMDS"), which the Commission continues to strengthen through favorable regulation. Id. at ¶ 22. Analog MMDS systems, for example, offer 20 to 30 channels of programming, and upgraded digital MMDS systems will provide a much larger number of channels.3/ Finally, developments in the courts and Congress are opening avenues for telephone companies to compete directly with cable television services and provide multiple outlets for video entertainment services in each market. Id. at ¶ 43. By the

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2/ In fact, at a recent meeting arranged by members of the FCC staff, Bernard B. Bossard, the inventor of CVNY's system architecture, stated that LMDS was not likely to be deployed in areas of high population density or where topography limits terrestrial transmission.

3/ Upgrading to digital technology will require large investments in an environment where MMDS is facing expanding competition from cable and DBS. LMDS systems will compete with MMDS for capital and customers and threaten the viability of existing MMDS systems.

time LMDS is operating, its service would add little to this mix of cable competitors. Indeed, the marginal benefits of LMDS in the short-term are tenuous at best.

III. TAKING A LONG-TERM PERSPECTIVE, THE COMMISSION MUST PROMOTE CABLE COMPETITION AND AT THE SAME TIME PRESERVE SPECTRUM FOR INTERNATIONAL SATELLITE USE.

The Commission has recognized that competition is increasing in the video distribution marketplace as a result of newly implemented technologies such as DBS, video dialtone and MMDS. Notice of Inquiry, at ¶¶ 6, 9. As new technologies emerge and as regulators allow additional entities to provide video programming, id. at ¶ 43, the video distribution marketplace will become even more fully competitive. Thus, the Commission must take a long-term perspective and not adopt short-term solutions like LMDS for a problem that is correcting itself, especially when licensing LMDS in the 28 GHz band will preclude the long-term development of international satellite services by United States companies.4/ Unlike LMDS, satellite services offer long-term and unique benefits to the communications marketplace because satellite technology provides a full range of information services to developing and undeveloped parts of the United States and the world. These areas otherwise would not receive affordable access to communications services due to the economic constraints of fiber optics, cable and other terrestrial services.

4/ Attached hereto are letters from the Office of Science and Technology Policy and National Telecommunications and Information Administration stating their support of satellite services in the 28 GHz band and concern that the licensing of LMDS there will preclude satellite operations.

Although CVNY claims that LMDS is an efficient means of access to the "Information Superhighway," CVNY Comments, at 7, its technology will not bring new services to currently unserved areas of the country. Moreover, LMDS is hardly "spectrum-efficient," id., because it employs inefficient analog AM and FM technology to provide duplicative video services. In contrast, satellite systems proposed for operation in the 28 GHz band will provide global access to a full range of basic and advanced information services at affordable costs.

The 28 GHz band was allocated internationally to the fixed satellite service at the 1971 World Administrative Radio Conference. The 28 GHz band is the only technically available band for the deployment of international FSS. LMDS, on the other hand, can operate in many portions of the spectrum, including the 40.5 - 42.5 GHz band. In fact, the 40.5 - 42.5 GHz band has been allocated in Europe for LMDS use. Unlike LMDS, satellite systems are not economically or technically constrained to urban areas. The cost of satellite service is independent of subscriber location, resulting in economical communications access by consumers in remote and rural parts of the world. Additionally, satellites can be employed to provide a full range of services, from basic voice to telemedicine and distance learning to emergency communications at times when natural disaster has disrupted wireline service.

The international nature of low earth orbit satellite communications requires global coordination of spectrum. If the United States unilaterally authorized the incompatible LMDS use of the 28 GHz band, then the development of innovative global

satellite systems would be curtailed. Such a result would significantly undermine the efforts of the United States to take a leadership role in the creation of a global information infrastructure and preclude benefits to users worldwide. Additionally, such action would impair an industry in which the United States enjoys a clear world leadership position. The commercial satellite industry is one where the United States enjoys clear global leadership, which derives in part from technologies developed in the U.S. space and defense programs. With the end of the Cold War and ensuing cutbacks in government aerospace programs, a robust commercial satellite industry is essential to continuing U.S. leadership in these advanced technologies. Support of the U.S. satellite industry is especially critical because the Japanese and Europeans are developing 28 GHz satellite systems that threaten to overtake to the United States in this area.

IV. CONCLUSION

As the Commission recognized in its Notice of Inquiry, a variety of new technologies has been and increasingly will be implemented within the video distribution marketplace to provide competition to cable. Notice of Inquiry, at ¶ 18. Thus, any shortfall in cable competition is a short-term problem requiring only transitional solutions. Importantly, if ultimately viable, LMDS is only a short-term source of competition to cable. LMDS is an unproven technology that at best will duplicate existing video distribution services in high-density markets. Moreover, the use of the 28 GHz band for LMDS will preclude the development

of global advanced broadband information systems provided by United States satellite operators, which can foster competition by providing service to remote and rural areas at an economical cost. The Commission must take a long-range perspective in its consideration of the video distribution marketplace and preserve spectrum for international satellite telecommunications.

Respectfully submitted,

TELEDESIC CORPORATION

By: 
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July 29, 1994

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EXECUTIVE OFFICE OF THE PRESIDENT
OFFICE OF SCIENCE AND TECHNOLOGY POLICY
WASHINGTON, D.C. 20500

December 2, 1993

The Honorable Reed E. Hundt
Chairman, Federal Communications Commission
Room 814
1919 M Street, NW
Washington, DC 20554

Dear Mr. Chairman:

This letter conveys OSTP's recommendations regarding the Notice of Proposed Rulemaking (January 8, 1993, CC Docket No. 92-297), which addresses the allocation of spectrum in the 27.5 - 29.5 GHz band for Local Multipoint Distribution Services (LMDS).

First, we are concerned that the proposed rule would eliminate the utility of Ka Band for high speed satellite communications. Second, international frequency allocations support Fixed Satellite Services (FSS) in this band, and there is already significant activity in this band by European and Japanese systems. Any loss of FSS access to Ka Band in the U.S. could prevent U.S. industry from aggressively moving into this band, resulting in the loss of service and manufacturing markets to overseas competitors. Third, NASA's Advanced Communications Technology Satellite (ACTS), representing an investment of about $200 million, is in orbit and the U.S. has committed to perform key demonstrations of new technologies for satellite communications at Ka Band. The proposed reallocation to non-satellite use could diminish the ACTS investment and will deny the U.S. satellite industry the opportunity to exploit the advantages which this band offers for satellite communications. Finally, maintaining consistency between U.S. frequency allocations and the international community will avoid coordination difficulties and will enable U.S. manufacturers to compete in their respective markets on a global basis.

Satellite communications will play a key role in the development of the National Information Infrastructure (NII). For that reason, the Office of Science and Technology Policy recommends that services which would pre-empt or interfere with the currently allocated FSS operation at Ka Band be prohibited, and that final judgement on this issue be deferred for at least five years to allow the satellite communications industry the opportunity to establish operational systems in this band. Should the industry fail to exploit this band for satellite communications, consideration should then be given to re-allocation to a service which would make better use of this part of the spectrum.

If you have any questions on this recommendation, please feel free to contact me at

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(202) 395-6175.

Sincerely,

[illegible]
Associate Director for
Technology and Space

cc: James A. Quello, Commissioner
Ervin S. Duggan, Commissioner
Andrew C. Barrett, Commissioner
Daniel S. Goldin, Administrator, NASA
Larry Irving, Assistant Secretary for Communications and Information, Department of Commerce
Kathleen Levitz, Acting Chief, Common Carrier Bureau, Federal Communications Commission

bcc: Stephen Neuwirth, Associate Counsel to the President
Tom Kalil, Director of Science and Technology, National Economic Council
Tim Fain, Office of Information and Regulatory Affairs, Office of Management and Budget
Paul Roosa, Office of Spectrum Management, National Telecommunications and Information Administration
Geoff Giffin, Civil Space Technology Initiative Manager, National Aeronautics and Space Administration

UNITED STATES DEPARTMENT OF COMMERCE
National Telecommunications and Information Administration
Washington, D.C. 20230

July 20, 1993

Ms. Kathleen Levitz
Acting Chief, Common Carrier Bureau
Federal Communications Commission
1919 M Street, N.W., Room 500
Washington, D.C. 20554

Re: CC Docket No. 92-297

Dear Ms. Levitz:

The National Telecommunications and Information Administration (NTIA) is the Executive branch agency principally responsible for the development and presentation of domestic and international telecommunications and information policy, the coordination of the telecommunications activities of the Executive branch, and the management of the Federal Government's use of the radio spectrum. NTIA hereby submits its views on Rulemaking to Amend Part 1 and Part 21 of the Commission's Rules to Redesignate the 27.5-29.5 GHz Frequency Band and to Establish Rules and Policies for Local Multipoint Distribution Service, Notice of Proposed Rulemaking, Order, Tentative Decision and Order on Reconsideration, 8 FCC Rcd 557 (1993) (LMDS NPRM).

NTIA has reviewed comments filed in the proceeding, including those of the National Aeronautics and Space Administration (NASA), Hughes, Sprint, US West, Loral Qualcomm, Suite 12, Motorola, and others. Based on this review, NTIA believes that the Local Multipoint Distribution Service (LMDS) may provide an important additional and competing form for distribution of wideband video signals to the consumer. However, NTIA believes that co-channel sharing in the same operating areas between LMDS services and transmitting earth stations operating in the fixed-satellite service (FSS) would be very difficult, requiring technical modifications or limitations to the LMDS implementation proposals, and will require careful coordination between stations in the two services.

NTIA proposes that before the Commission decides to redesignate any portion of the 27.5-29.5 GHz band for LMDS use, it should carefully consider: 1) the strategic, long-range effects on domestic and international implementation of future FSS services; 2) the use of advanced modulation techniques by LMDS and the potential they offer regarding reduced bandwidth and enhanced interference rejection; and 3) the development of sharing and coordination procedures, including representative distance and frequency separations, that can be used to further clarify issues of sharing between the respective services.

Further, if two service providers are deemed necessary in each LMDS market, the Commission should evaluate the merits of placing one service provider in the Earth station transmitting band and the other in the companion receiving band. This is particularly important since Commission proposals to assign 1 GHz for each of two LMDS service providers in each market would impact 80% (2 GHz out of 2.5 GHz total) of the entire 27.5-30 GHz band allocated to the FSS for transmitting earth stations. In addition, 80% of the

companion receiving earth station band at 17.7-20.2 GHz could not be used as planned. The alternate approach suggested here would preserve use of 60% of the companion band for receiving earth stations.

Over the last decade, the Federal Government has made a large investment in the development of the technology necessary for communication satellites to operate in the 27.5-30 GHz band. Most of that investment has been for the development of NASA's Advanced Communications Technology Satellite (ACTS). The technologies developed through ACTS have the potential to stimulate the use of the 27.5-30 GHz band by the FSS and to ensure that the band is used in an efficient and cost-effective manner. Technologies developed for ACTS include on-board routing and processing, multiple high gain hopping spot beams, wide bandwidth transponders, and the use of many very small earth stations (VSATs) that are to be deployed throughout metropolitan areas (often on customers' premises) for the 27.5-30 GHz and 17.7-19.7 GHz bands. These developments were intended to reduce industry's risk, to stimulate interest, and to promote U.S. competitiveness in the use of these bands for commercial satellite systems.

The LMDS has a "multicell multipoint configuration" (See LMDS NPRM, at para. 22), and does not use the point-to-point configuration common to most fixed service applications that have successfully shared bands with the FSS. This makes coordination and band sharing more difficult. Band sharing can generally occur as long as acceptable sharing criteria are defined, such as: 1) assigning different frequencies to the two stations at a given location; 2) selecting sufficient spatial or angular separation to preclude interference; or 3) defining system parameter minimum and maximum values (these could include relative signal levels; relative sidelobe and backlobe antenna levels; permissible signal to interference levels; and for digital systems, coding diversity).

A common solution for sharing is to require sufficient spatial and angular separations to ensure interference free operation of nearby stations in the shared bands. The calculations shown in the Enclosure for earth stations similar to those used with the NASA ACTS system indicate that separation distances for FSS stations must be beyond the horizon (123-193 km) in most circumstances. However, such separation distance requirements for compatible operation are not practical in areas where LMDS subscribers and FSS earth stations must coexist. Indeed, restricting the locations of FSS earth stations to areas beyond the horizon from metropolitan areas would be impractical, except for isolated cities in the center of the United States. As noted by NASA, none of the normal sharing mechanisms are practical for LMDS/FSS (see NASA Comments, pp. B-10 & B-11). Thus, other sharing criteria involving technical modifications or limitations to LMDS proposals are needed to permit compatible sharing with the FSS.

"Feeder link" transmissions to low Earth-orbiting satellites operating in the mobile-satellite service (MSS) have been proposed for the 27.5-30 GHz band. Separation distance requirements between these earth stations (which operate in the FSS) and the LMDS subscribers would be at least as large as those for the more conventional FSS earth stations,

and sharing would be at least as difficult (assuming characteristics similar to those shown for feeder link earth stations in the NASA Comments, pp. B-7 & B-8).

Current LMDS implementation proposals use relatively inexpensive Frequency Modulation (FM) analog video techniques. FM signal levels must generally be 20 times (13 dB) greater than noise levels and 40-200 times (16-23 dB) greater than interfering signal levels for acceptable operation. However, if carefully designed digitally modulated signals are used that encompass suitable compression and error correction techniques, there is potential for operating in higher noise and interference environments.

Analog modulation techniques are also generally less spectrum efficient than modern digital techniques. As shown in the Appendix, the FM modulated video signals proposed for LMDS, require 18 MHz bandwidth signals with 20 MHz channels for each video channel transmitted. However, to illustrate an advantage of advanced digital techniques, digitally modulated High Definition Television is expected to require only 6 MHz to transmit much more information. If the LMDS were to use advanced digital modulation there is potential both for increased capacity in any given bandwidth and, with proper design, increased ability for a subscriber's LMDS receiver to differentiate between the desired LMDS signal and the interfering earth station signal. Before the Commission reaches a final decision, serious consideration should be given to the trade-offs between analog and digital implementations for LMDS. In particular, factors such as, interference immunity, coordination, system performance, and capacity should be considered, especially since the original analysis supporting the current LMDS analog implementation proposals were made two years ago (see Petition of Suite 12 Group, RM 7872 App B p 97).

Redesignating a portion of the 27.5-30 GHz band to accommodate multipoint technology will limit, and perhaps preclude, use of that portion of the band for new and innovative FSS applications. However, the FSS (Earth-to-space) allocation in the 27.5-30 GHz band is paired with an FSS (Space-to-Earth) allocation in the 17.7-20.2 GHz band. If a portion of the Earth-to-space band is made unusable, the paired portion of the space-to-Earth band is also made unusable for the FSS, thus the LMDS proposals would effectively preclude the use of both the 27.5-29.5 GHz and the 17.7-19.7 GHz bands by the FSS.

While the 27.5-30 GHz band remains largely unused, FSS technology for the band is being developed in Europe and Japan, as well as in the United States. Continued worldwide development of this band, allocated to the FSS throughout the world by the International Telecommunication Union, is expected. Successful demonstration of this technology by ACTS in the United States could lead to efficient and effective use of the band by commercial systems. International pressures brought by successful implementations in other countries will also spur use in this country. Although sharing between the FSS and conventional terrestrial point-to-point is generally feasible, co-channel sharing between the FSS and point-to-multipoint stations is considerably more complex and difficult. In this regard, regulatory actions that substantially limit future FSS developments could put the United States at odds with the implementation of existing worldwide allocations, and place

U.S. industry at a disadvantage in the international marketplace. Furthermore, the search for additional FSS allocations, if a domestic shortfall in usable spectrum occurs, would be difficult.

In summary, decisions by the Commission in the LMDS matter could preclude shared use with FSS users in common bands and geographic areas. In arriving at its decision, the Commission should give careful consideration to the strategic, long-range effects on domestic and international implementation of future FSS services. It should also recognize that FSS technology in these bands is in the initial stages of development and could be adversely affected by allocation decisions that inhibit future flexibility and growth. The LMDS proposal, as presently defined, embraces analog technologies, which are spectrally inefficient and potentially less interference resistant than some digital techniques. The issues pertaining to analog or digital signals, coding diversity, and bandwidth compression techniques merit further, in-depth, consideration.

NTIA has undertaken a Strategic Planning Program that includes a Notice of Inquiry into spectrum requirements for government and industry. Comments received in response to the Notice generally support the retention of the current spectrum allocations for the FSS. While not forecasting the need for more spectrum, the FSS developers and users fully expect that currently allocated spectrum will be available for future use. Commenters note that although voice traffic is decreasing, the use of video and data is increasing at a rapid pace. The national economic recovery is expected to spark increased use of VSAT technology, such as that being investigated by NASA's ACTS program. Commenters also noted that new technologies to be tested in the FSS may increase demand for VSAT technology and promote small business use of these services.

It is important to provide the American public with quality radiocommunications services. The LMDS and FSS systems under consideration for the 27.5-30 GHz band represent potentially valuable new applications of technology for the public. Thus, it is vital, if the LMDS and FSS services are to share spectrum, that service rules and sharing criteria be developed that do not unduly impact either service category. We would be pleased to have further discussions on this matter of broad national interest.

Sincerely,

Richard D. Parlow
Associate Administrator
Office of Spectrum Management

Enclosure

cc: James A. Quello, Acting Chairman
Ervin S. Duggan, Commissioner
Andrew C. Barrett, Commissioner
Dr. Thomas P. Stanley, Chief, Office of Engineering Technology
Charles T. Force, NASA, Associate Administrator for Space Communications

Enclosure

Technical Calculations

LMDS FSS INTERFERENCE CALCULATIONS

NTIA has used the following formula to calculate the noise level in a receiver.

$N = 10 \text{ Log } kTB_R + NF$

Where, as shown in the Table, for LMDS-subscriber receivers:

$B_R = 18$ MHz

$NF = 6$ dB
$G_R = 32$ dBi

and,

k = Boltzmann's Constant = -228.6 (dBW/K/Hz)
$T = 290$ K.

Thus, the LMDS receiver noise level, N is:

$N = -126.5$ dBW

In addition, NTIA has used the following formula to calculate the maximum acceptable interference level, assuming that the interference signal level must be kept 10 dB below the noise (*i.e.*, the $INR_{Max} = -10$ dB).

$$I_{Max} = INR_{Max} + N = -10 + (-126.5) = P_T + G_T + G_R - L_{P,\,Min} + 10 \text{ Log}(B_R/B_I)$$

For ACTS, HDR signals, using the characteristics shown in the Table, NTIA has calculated the minimum path loss and separation distance as follows.

$P_T = 20$ dBW
$G_T = -8$ dBi (horizontal gain)
$B_I = 900$ MHz

$$L_{P,\,Min} = 136.5 + 20 + (-8) + 32 + (-17)$$
$$= 163.5 \text{ dB}$$

which, corresponds to a minimum separation distance of 123 km for free space propagation. The results of similar NTIA calculations for an INR_{Max} of 3 dB and for the ACTS VSAT terminal are shown in the Table.

Table. **Possible Interference Effects of ACTS Earth Station on LMDS Subscriber (Co-frequency Operation Assumed)**

ACTS Earth Stations[1]		
	High Data Rate Terminal	Very Small Aperture Terminal
Power Amplifier Output	100 Watts	46 Watts
Mainbeam Transmit Antenna Gain	56 dBi	55 dBi
Horizontal Transmit Antenna Gain (per CCIR Recommendation 465)	-8 dBi	-8 dBi
Transmit Bandwidth	900 MHz	41.5 MHz
Elevation Angle to Satellite	40°	40°
LMDS Subscriber Receiver[2]		
Receiver Noise Figure	6 dB	
Receiver Noise Power	-126.5 dBW	
Receiving Antenna Gain	32 dBi	
Channel Separation	20 MHz	
Receiver Bandwidth	18 MHz	
Separation Required For Both Systems Operating on 29.36 GHz		
Interference Power = 0.1 x Receiver Noise Power	123 km	193 km
Interference Power = 0.5 x Receiver Noise Power	55 km	86 km

[1] Data on ACTS High Date Rate Earth Terminals based on information supplied by NASA to NTIA.

[2] These characteristics are calculated from those provided by Suite 12 in Petition of Suite 12 Group for Amendment of Part 21 of the Commission's Rules to Allocate Spectrum for, and to Establish Other Rules and Policies Regarding, Multichannel Local Distribution Services in the 27.5-29.5 GHz Band, RM 7872, App B at pp. 15-26 (filed September 24, 1991).